



**US Army Corps
of Engineers®**
Portland District

SIUSLAW RIVER SEDIMENT QUALITY EVALUATION REPORT



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EPA	Environmental Protection Agency
USACE	U.S. Army Corps of Engineers
ODEQ	Oregon Department of Environmental Quality
DMEF	Dredge Material Evaluation Framework
NES	Newly Exposed Surface
QA/QC	Quality Assurance/Quality Control
TOC	Total Organic Carbon
PAH	Polynuclear Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
MRL	Method Reporting Limit
TVS	Total Volatile Solids
ND	non-detect
ppm	parts per million – mg/kg
ppb	parts per billion – ug/kg & ug/L
pptr	parts per trillion – ng/kg
SL	Screening level
As	Arsenic
Cd	Cadmium
Ni	Nickel
Cu	Copper
Sb	Thallium
Cr	Chromium
Pb	Lead
Hg	Mercury
Ni	Nickel
Ag	Silver
Zn	Zinc
ID	Identification Number
P	Ponar (sediment surface grab sampler)
HC	Hand Core (hand push tube sediment sampler)
BC	Boxcore sediment sampler (surface)
VC	Vibra-core sediment sampler
GC	Gravity-core sediment sampler
RMT	Regional Management Team (Corps-NWP, EPA, ODEQ)
NWP	US Army Corps of Engineers, North Western (Division) Portland District
SEF	Sediment Evaluation Framework

Note: This Siuslaw River Sediment Quality Evaluation Report was reviewed by the Regional Sediment Evaluation Team (RSET) in accordance with the DMEF (1998) and the SEF (2006). The RSET consists of Portland District Corps of Engineers, EPA, NMFS, USF&W and ODEQ personnel. All comments received have been incorporated into the report and will be considered final at the end of the review period, March 2007.

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ABSTRACT

As part of Portland District's Operation and Maintenance Program to dredge federally authorized projects, this report characterizes the sediment quality conditions at the Siuslaw River entrance to river mile (RM) 5 at Florence Oregon. It reflects conditions during the sampling event described and evaluates the sample data of the potential dredge material, to determine suitability of disposal options.

The authorized federal channel at the Siuslaw River runs from the entrance to river mile RM 16.5 (see figure 1). However, only the entrance to RM 5 and turning basin opposite the marina at Florence are currently maintained by the Corps. The authorized entrance channel into the Siuslaw River is 18 feet deep and 300 feet wide; it runs from deep water to RM 0.2. From there, the channel is 16 feet deep and 200 feet wide, to the dock at Florence at RM 5.0. The channel widens at bends in the river. A turning basin opposite the dock is 16 feet deep, 400 feet wide and 600 feet long. From Florence, a 12-foot deep, 15-foot wide channel runs to RM 16.5, this portion of the channel is not maintained by the Corps. At RM 15.8, the channel widens into a turning basin 12 feet deep, 300 feet wide and 500 feet long.

Shoaling at the entrance usually requires dredging to 20 to 22 feet to ensure the authorized depth of 18 feet between dredging operations. The entrance and south jetty shoals build during late winter and spring. The inside range and south turn shoals are affected more by river flood stages than by tidal action. A small hopper dredge removes material from the entrance shoals between April and October.

Shoals result from the river moving sand supplied by dunes to the south; in addition, shoaling results from movement of the river's normal bed load. The same hopper dredge that works the entrance bar would dredge the lower river, from RM 0.0 to the Highway 101 Bridge near RM 4.8. Removing shoals above the Highway Bridge with a hopper dredge is possible, but the lack of in-water disposal sites makes this dredging impractical.

The channel above RM 5.0 requires infrequent maintenance. A pipeline dredge last cleared the shoals at RM 5.5 and 6.0 in 1981. No dredging has been performed above that point since 1976. Some shoaling occurs from RM 5.0 to RM 16.0, but it has remained fairly constant and is not limiting traffic.

In August 2006, seven (7) surface grab samples were collected in the Siuslaw River from the entrance to River Mile (RM) 6. Sediments collected for analysis are considered representatives of the material to be dredged including any advanced maintenance or overdepth material. All samples were submitted for physical analyses, with grain-size ranging from 98.5% to 95.4% poorly graded sand (mean 97.1%), with volatile solids content ranging from 0.69% to 2.24% (mean 1.14 %). One (1) sample was selected for chemical analyses to include select chemicals of concern from the following: metals, total organic carbon (TOC), pesticides/polychlorinated biphenyls (PCBs), chlorinated hydrocarbons, phenols, phthalates, miscellaneous extractables, polynuclear aromatic hydrocarbons (PAHs), with two (2) samples submitted for organotin (TBT)

(total) analysis. The first sample analyzed for TBT was collected in the turning basin, adjacent to the marina (sample 06). Sample 07, collected in the federal channel by the fuel dock, was submitted for all chemical parameters listed above. Pore-water TBT was not run due to insufficient pore-water in the samples, a result of the high sand content of the sample not containing the required volume of pore water for analysis.

Sediment represented by samples collected during this sampling event meet the Tier II guidelines established in the DMEF/SEF for unconfined in-water placement without further characterization.

INTRODUCTION

The sampling and analysis objectives are stated in the Sampling and Analysis Plan (SAP January 2005), and are, also, listed below. This report will characterize the sediment to be dredged and outline the procedures used to accomplish these objectives.

Sampling and Analysis Objectives

- To characterize sediments in accordance with the regional dredge material testing manual protocols, the Dredge Material Evaluation Framework (DMEF 1998) and Sediment Evaluation Framework (SEF 2006), as well as, the Evaluation of Dredged Material Proposed for Disposal at Island, Nearshore, or upland Confined Disposal Facilities – Testing manual (Upland Testing Manual).
- Collect, handle and analyze representative sediment from the federal channel in Siuslaw entrance and river, to RM 5, in accordance with protocols and Quality Assurance/Quality Control (QA/QC) requirements.
- Analyze for full suite of physical and chemical parameters as outlined in the DMEF and SEF Tier II a & b on select samples.

HISTORICAL SEDIMENT SAMPLING

Portland District routinely evaluates sediment from the federal project at Siuslaw from the entrance to RM 5 and the turning basin opposite the marina at Florence on an approximate 5-year rotation. Physical evaluation sampling was performed at Siuslaw River starting in 1960's and 1970's and continued in 1984, 1985, 1987, 1991, 1996 and 2001. Chemical analyses were conducted as part of the 1991 and 2001 sampling events. The results of these studies revealed the sediment, especially in Federal channel areas, to be predominately fine-grained sands with a low organic content. Sediment from the previous studies has been determined to be suitable for in-water disposal.

In 1987 Portland District personnel sampled seventeen (17) stations in the estuary and analyzed for physical analyses only.

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In 1991 the Portland District collected ten (10) sediment samples from the federal navigation project for physical analysis, with one sample being subjected to chemical analyses. Siuslaw River sediments are 99.9% poorly graded sand with low volatile solids content (1.1%). The median grain size (0.32 mm) was that of medium sand. The results of the chemical analysis from the turning basin at RM 5.0 near the town of Florence had metals concentrations below established levels of concern. No pesticides, PCBs, PAHs, or phenols were detected.

Ten (10) surface grab samples were collected in 1996 using a ponar sampler, from the entrance to RM 8. These samples were subjected to physical tests, with grain-size ranging from 100% to 92.7% (mean 98.6%) poorly graded sand with volatile solids content ranging from 1.4% to 0.3% (mean 0.8 %). The mean grain-size is that of medium sand (0.294 mm).

In 2001 eight (8) surface grab samples were collected in the Siuslaw River from the entrance to River Mile (RM) 6. All samples were submitted for physical analyses, with grain-size ranging from 100% to 97.9% (mean 99.2%) poorly graded sand with volatile solids content ranging from 0.42% to 3.0% (mean 1.29 %). The mean grain-size is that of medium sand (0.29 mm).

Two (2) samples were selected for chemical analyzes to include: metals, total organic carbon (TOC), pesticides/polychlorinated biphenyls (PCBs), chlorinated hydrocarbons, phenols, phthalates, miscellaneous extractables, polynuclear aromatic hydrocarbons (PAHs) and one (1) sample was submitted for organotin (TBT) (pore water method) analysis. The samples submitted for chemical analysis were taken from the federal channel near the outfall to the sewage treatment plant (sample 5) and near the boat dock (sample 7). The one (1) sample analyzed for TBT was collected near the boat dock (sample 7).

Sediment represented by samples collected during this sampling event meet the Tier II guidelines, established in the DMEF/SEF for unconfined in-water placement, without further characterization.

CURRENT PROJECT

The most recent hydrographic survey maps, August 2006, indicate shoals that are proposed for dredging from river mile (RM) 2.0 to 5.3, with only very minor shoals between RM 0.0 to 2.0. The dredging prism varies in depth from 0 to 9 feet, with an authorized 2-foot advanced maintenance and a potential precision overdepth allowance will make a total dredge depth of up to 12'.

Due to the homogenous high-sand content material in these areas and the ineffectiveness of coring devices to penetrate and retrieve sandy substrates; surface grab samples, using a Ponar sampler, were selected to characterize the dredge material (See DMEF, 7.4b, page7-3).

As part of this sampling event (2006), seven (7) samples were collected in the Siuslaw River from the entrance to River Mile (RM) 5. All samples were submitted for physical analyses, with grain-size ranging from 98.5% to 95.4% poorly graded sand (mean 97.1%), with volatile solids content ranging from 0.69% to 2.24% (mean 1.14 %). One (1) sample was selected for chemical analyzes to include: metals, total organic carbon (TOC), pesticides/polychlorinated biphenyls (PCBs), chlorinated hydrocarbons, phenols, phthalates, miscellaneous extractables, polynuclear

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aromatic hydrocarbons (PAHs), with two (2) sample submitted for organotin (TBT) analysis. The first sample analyzed for TBT was collected in the turning basin, adjacent to the marina (sample 6). Sample 7 collected in the federal channel by the fuel dock was submitted for all chemical parameters listed above. Pore-water TBT was not analyzed due to insufficient pore-water volume in the samples, a result of the high sand content.

The chemical analyses indicated only low levels of contamination in any of the samples, with all levels well below their respective DMEF/SEF screening levels (SLs). No pesticides, PCBs, PAHs, chlorinated hydrocarbons or miscellaneous extractables were detected in any of the samples. Several metals, phthalates, phenol and dibutyltin were detected, but at low levels, well below their respective screening levels. Detection levels were sufficiently low enough to evaluate material proposed for dredging. The analytical results of this characterization are consistent with historical data.

Sediment represented by samples collected during this sampling event meet the Tier II guidelines established in the DMEF/SEF for unconfined in-water placement without further characterization.

Table 1 lists the Project Team their duties and responsibilities for the sediment-sampling project at Siuslaw Federal Channel.

Table 1: Project Team

Task/Responsibility	CENWP Tim Sherman	CENWP Mark Siipola	CENWP Staff	Columbia Analytical Laboratories	A/E Contractor
Overall Project Management	X				
Sampling Plan Development	X				
Agency Coordination	X	X			
Positioning/Log Record	X		X		X
Sediment Sampling	X	X	X		
Physical Analysis				X	
Chemical Analysis				X	
Final Report	X				
Technical Review		X			
Boat & Operator					X

Table 2 lists the proposed sampling coordinates within Siuslaw Federal Channel. Coordinates are based on the Lambert Projection for Oregon; South Zone (NAD 83, U.S. Survey Feet) Datum is Mean Lower Low Water, (MLLW is 3.61 feet below National Geodetic Vertical Datum at the Entrance, 3.56 at Florence and 3.52 at Cushman, 1947 adjustment.)

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Table 2: Sampling Station Coordinates (NAD 83, Oregon State Plane South)

082906SLFC-BC-01 44° 01' 02.7" 124° 08' 31.6"	082906SLFC-BC-02 44° 00' 47.9" 124° 07' 45.9"
082906SLFC-BC-03 43° 59' 24.6" 124° 07' 15.4"	082906SLFC-BC-04 43° 58' 55.1" 124° 07' 35.2"
082906SLFC-BC-05 43° 58' 06.8" 124° 07' 07.4"	082906SLFC-BC-06 43° 57' 53.7" 124° 06' 16.6"
082906SLFC-BC-07 43° 58' 02.8" 124° 06' 02.8"	

RESULTS

Physical (grain-size), Volatile Solids (ASTM methods) and Total Organic Solids (method 9060)

Seven (7) samples were submitted for testing, with data presented in Table 3. The grain-size analyses resulted in mean values of 0.2% gravel (shell hash, 0.0%-0.5% range), 97.1% sand (95.4%-98.5% range), and 2.7% silt/clay (1.5%-4.1% range), with 1.14% volatile solids (0.69%-2.24% range). The TOC mean value is 0.13% (0.04-0.26 range).

Metals (EPA method 6020/7471)

One (1) sample was submitted for testing, with data presented in Table 4. Low levels of As, Cd, Cr, Cu, Ni, Pb, Hg and Zn were detected in all samples, no Sb was detected in any samples, with no levels approaching their respective DMEF/SEF SL.

PCBs (EPA method 8082)

One (1) sample was submitted for testing, with data presented in Table 5. No PCB aroclors were detected at the MDL in any of the samples.

Pesticides (EPA method 8081)

One (1) sample was submitted for testing, with data presented in Table 6. No pesticides (including DDT) were detected at the MDL in any of the samples.

Chlorinated Hydrocarbons (EPA method 8270)

One (1) sample was submitted for testing, with data presented in Table 7. No chlorinated hydrocarbons were detected at the MDL in any of the samples.

Miscellaneous Extractables (EPA method 8270)

One (1) sample was submitted for testing, with data presented in Table 8. No miscellaneous extractables were detected at the MDL in any of the samples.

Phthalates (EPA method 8270)

One (1) sample was submitted for testing, with data presented in Table 9. Di-n-butyl phthalate was detected, at a level between the MRL and the MDL in the sample; this value is considered an estimate by the laboratory. The value was well below the DMEF/SEF SLs.

Phenols (EPA method 8270)

One (1) sample was submitted for testing, with data presented in Table 10. Phenol was detected at a level between the MRL and the MDL; this value is considered an estimate by the laboratory. The value was well below the DMEF/SEF SLs.

Polynuclear Aromatic Hydrocarbons Low Molecular Weight (EPA method 8270C)

One (1) sample was submitted for testing, with data presented in Table 11. No Low Molecular Weight PAHs were detected at the MDL in any of the samples.

Polynuclear Aromatic Hydrocarbons High Molecular Weight (EPA method 8270C)

One (1) sample was submitted for testing, with data presented in Table 12. No High Molecular Weight PAHs were detected at the MDL in any of the samples.

Tributyltin [Total (Bulk) Krone method]

Two (2) samples were submitted for testing, with data presented in Table 13. Pore-water TBT was not analyzed due to insufficient pore-water volume in the samples, a result of the high sand content. Total TBT was run on the sample from the turning basin (06) and the sample collected by the refueling dock (07). Organotin was detected as Dibutyltin (0.11ug/kg) in sample 07 at a level between the MRL and the MDL; this value is considered an estimate by the laboratory and was also present in the method blank analysis (0.091ug/kg). The DMEF/SEF does not have a marine SL value, only a pore water value. However, with little to no total (bulk) organotin detected, at sufficiently low detection levels in the sediment tested, there would be no organotin available to leach into the porewater and full characterization is possible.

CONCLUSION

Collection and evaluation of the sediment data was completed using guidelines from the DMEF/SEF. These are regional manuals developed jointly with regional federal and state agencies. This document is guidance for implementing the Marine Protection, Research, and Sanctuaries Act and Clean Water Act (40 CFR 230), Section 404 (b)(1). The screening levels used are those adopted for use in the DMEF/SEF.

In August 2006, seven (7) surface grab samples were collected in the Siuslaw River from the entrance to River Mile (RM) 6. Sediments collected for analysis are considered representatives of the material to be dredged including any advanced maintenance or overdepth material. All samples were submitted for physical analyses, with grain-size ranging from 98.5% to 95.4% poorly graded sand (mean 97.1%), with volatile solids content ranging from 0.69% to 2.24% (mean 1.14 %). One (1) sample was selected for chemical analyzes to include: metals, total organic carbon (TOC), pesticides/polychlorinated biphenyls (PCBs), phenols, phthalates, miscellaneous extractables, polynuclear aromatic hydrocarbons (PAHs) and two (2) sample were submitted for organotin (TBT) (total) analysis. The first sample analyzed for TBT was collected in the turning basin, adjacent to the marina (sample 6). Sample 7 collected in the federal channel by the fuel dock was submitted for all chemical parameters listed above. Pore-water TBT was not run due to insufficient pore-water in the samples, a result of the high sand content of the sample not containing the required volume of pore water for analysis.

Sediment represented by samples collected during this sampling event meet the Tier II guidelines established in the DMEF/SEF for unconfined in-water placement without further characterization.

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Table 3: Physical Analysis and Volatile Solids

Sample I.D.	Grain Size Percent (%)				
	Gravel (shell hash)	Sand	Silt/Clay	Volatile Solids	TOC
082906SLFC-BC-01	0.5	97.9	1.6	0.69	0.04
082906SLFC-BC-02	0.0	98.5	1.5	0.74	0.07
082906SLFC-BC-03	0.0	97.9	2.1	0.97	0.26
082906SLFC-BC-04	0.1	97.1	2.8	0.52	0.11
082906SLFC-BC-05	0.2	97.1	2.7	1.34	0.09
082906SLFC-BC-06	0.1	96.1	3.8	1.49	0.09
082906SLFC-BC-07	0.5	95.4	4.1	2.24	0.24
Average	0.2	97.1	2.7	1.14	0.13
Minimum	0.0	95.4	1.5	0.69	0.04
Maximum	0.5	98.5	4.1	2.24	0.26
SLFC = Siuslaw Federal Channel BC = Boxcore (surface grab sampler)					



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Table 4: Inorganic Metals - EPA method 6000/7000 (mg/kg)

Sample I.D.	As	Cd	Cr	Sb	Cu	Pb	Ni	Ag	Zn	Hg
082906SLFC-BC-07	2.87	0.04	12.6	<0.05	3.02	3.6	7.95	0.016	28.5	0.005
DMEF/SEF (SL)	57/57	5.1/5.1	--/260	150/150	390/390	450/450	140/--	6.1/6.1	410/410	0.41/0.41
Symbol (<) = Non-detect (ND) at the value listed (Method Detection Limit). Symbol (--) = Screening Level not established.										

Table 5: Polychlorinated Biphenyl (PCBs) - EPA Method 8082 (ug/kg)

Sample I.D.	PCB Aroclors							
	1016	1221	1232	1242	1248	1254	1260	Sum Σ
	082906SLFC-BC-07	<2.3	<2.3	<2.3	<2.3	<2.3	<2.3	ND
DMEF/SEF (SL)							Total	130/130
Dredge Material Evaluation Framework (1998) Sediment Evaluation Framework (2006 Interim Final Marine S1 value) Symbol (<) = Non-detect (ND) at the value listed (Method Detection Limit).								



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Table 6: Pesticides - EPA Method 8081 (ug/kg)

Sample I.D.	Aldrin	Chlordane	Dieldrin	Heptachlor	Gamma-BHC (Lindane)	4,4'-DDD	4,4'-DDE	4,4'-DDT	Sum Σ DDT
082906SLFC-BC-07	<0.26	<4.4	<0.40	<0.36	<0.21	<1.4	<1.0	<0.27	ND
DMEF/SEF SL	10/9.5	10/2.8	10/1.9	10/1.5	10/--	--/16	--/9.0	--/12	6.9/--
Symbol (<) = Non-detect (ND) at the value listed (Method Detection Limit). Symbol (--) = Screening Level not established.									

Table 7: Chlorinated Hydrocarbons - EPA Method 8270 (ug/kg)

Sample I.D.	1,3-Dichlorobenzene	1,4-Dichlorobenzene	1,2-Dichlorobenzene	1,2,4-Trichlorobenzene	Hexachlorobenzene
082906SLFC-BC-07	<2.2	<2.6	<1.8	<2.1	<1.9
DMEF/SEF SL	170/--	110/110	35/35	31/31	22/22
Symbol (<) = Non-detect (ND) at the value listed (Method Detection Limit). Symbol (--) = Screening Level not established.					



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Table 8: Miscellaneous Extractables - EPA Method 8270C (ug/kg)

Sample I.D.	Benzyl alcohol	Benzoic Acid	Dibenzofuran	Hexachloroethane	Hexachloro-butadiene	N-Nitroso diphenylamine
082906SLFC-BC-07	<5.0	<130	<1.8	<3.0	<1.9	<3.0
DMEF/SEF SL	57/57	650/650	540/540	1400/1400	29/29	28/28
Symbol (<) = Non-detect (ND) at the value listed (Method Detection Limit).						

Table 9: Phthalates - EPA Method 8270C (ug/kg)

Sample I.D.	Dimethyl phthalate	Diethyl phthalate	Di-n-butyl phthalate	Butyl benzyl phthalate	Bis (2-ethylhexyl) phthalate	Di-n-octyl phthalate
082906SLFC-BC-07	<2.4	<4.8	5.7J	<2.1	3.0J	<1.7
DMEF/SEF SL	1400/71	1200/200	5100/1400	970/63	8300/1300	6200/6200
Symbol (<) = Non-detect (ND) at the value listed (Method Detection Limit). J = Estimated value (reported values are above the MDL, but below the PQL).						



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Table 10: Phenols - EPA Method 8270C (ug/kg)

Sample I.D.	Phenol	2-Methyl phenol	4-Methyl phenol	2,4-Dimethyl phenol	Pentachloro phenol
082906SLFC-BC-07	14J	<4.6	<4.0	<7.5	<12
DMEF/SEF SL	420/420	63/63	670/670	29/29	400/400
Symbol (<) = Non-detect (ND) at the value listed (Method Detection Limit). J = Estimated value (reported values are above the MDL, but below the PQL).					

Table 11: Polynuclear Aromatic Hydrocarbons (PAHs) Low Molecular Weight - EPA Method 8270C (ug/kg)

Sample I.D.	Acenaphthene	Acenaphthylene	Anthracene	Fluorene	2-Methyl naphthalene	Naphthalene	Phen-anthrene	Total Low PAHs
082906SLFC-BC-07	<1.4	<1.9	<1.9	<2.3	<1.7	<1.8	<1.8	ND
DMEF/SEF SL	500/500	560/560	960/960	540/540	670/670	2100/2100	1500/1500	5200/5200
Symbol (<) = Non-detect (ND) at the value listed (Method Detection Limit).								



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Table 12: Polynuclear Aromatic Hydrocarbons (PAHs) High Molecular Weight - EPA Method 8270C (ug/kg)

Sample I.D.	Benzo(a)-anthracene	Benzo-fluoro-anthenes	Benzo-(g,h,i)-perylene	Chrysene	Pyrene	Benzo(a)-pyrene	Indeno-(1,2,3-cd)-pyrene	Dibenzo(a,h)anthracene	Fluor-anthene	Total High PAHs
082906SLFC-BC-07	<1.9	<3.4	<3.1	<1.9	<1.8	<2.2	<2.6	<3.0	<3.0	ND
DMEF/SEF SL	1300/ 1300	3200/ 3200	670/ 670	1400/ 1400	2600/ 2600	1600/ 1600	600/ 600	230/ 230	1700/ 1700	12000/ 12000

Symbol (<) = Non-detect (ND) at the value listed (Method Detection Limit).

Table 13: Total Organotin Krone Method (ug/kg)

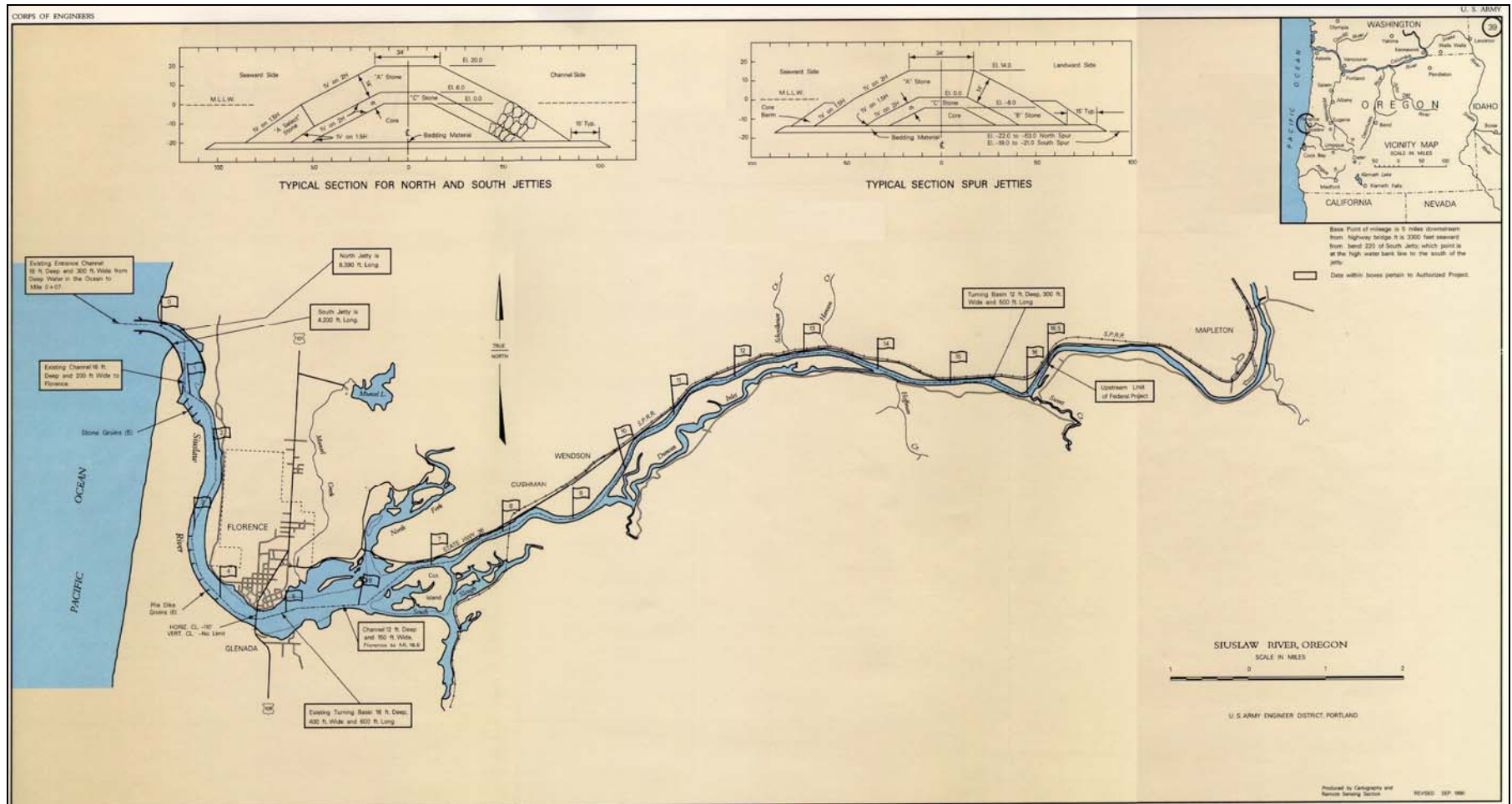
Organotin				
Sample I.D.	Total (Bulk) ug/kg			
	Monobutyltin	Dibutyltin	Tributyltin	Tetrabutyltin
082906SLFC-BC-06	<0.26	<0.037	<0.074	<0.092
082906SLFC-BC-07	<0.21	0.11JB	<0.076	<0.095
Screen level (SL)*	73*			

Symbol (<) = Non-detect (ND) at the value listed (Method Detection Limit).
 *DMEF/SEF does not have a total TBT screening level for marine sediments. 73 ug/kg was the accepted historic SL for TBT and the SEF has established 75 ug/kg for fresh water sediments. Pore-water TBT was not run due to lack of extractable pore water in samples submitted (high-sand content samples).
 J = Estimated value (reported values are above the MDL, but below the PQL).
 B = Detected in the method blank at 0.091 ug/kg.

SIUSLAW RIVER SEDIMENT QUALITY EVALUATION

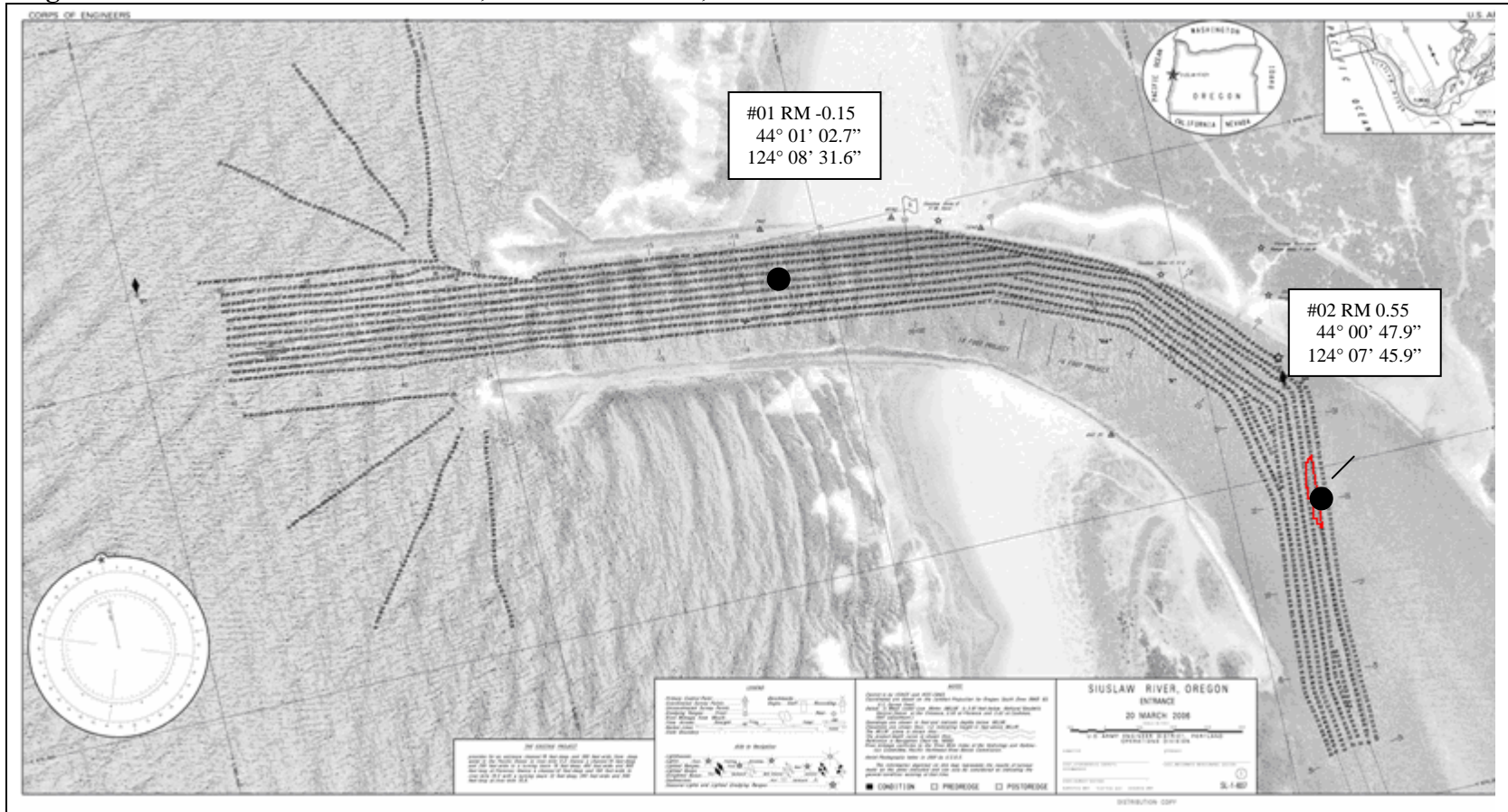
Sampled August 29, 2006

Figure 1: Siuslaw River Vicinity Map



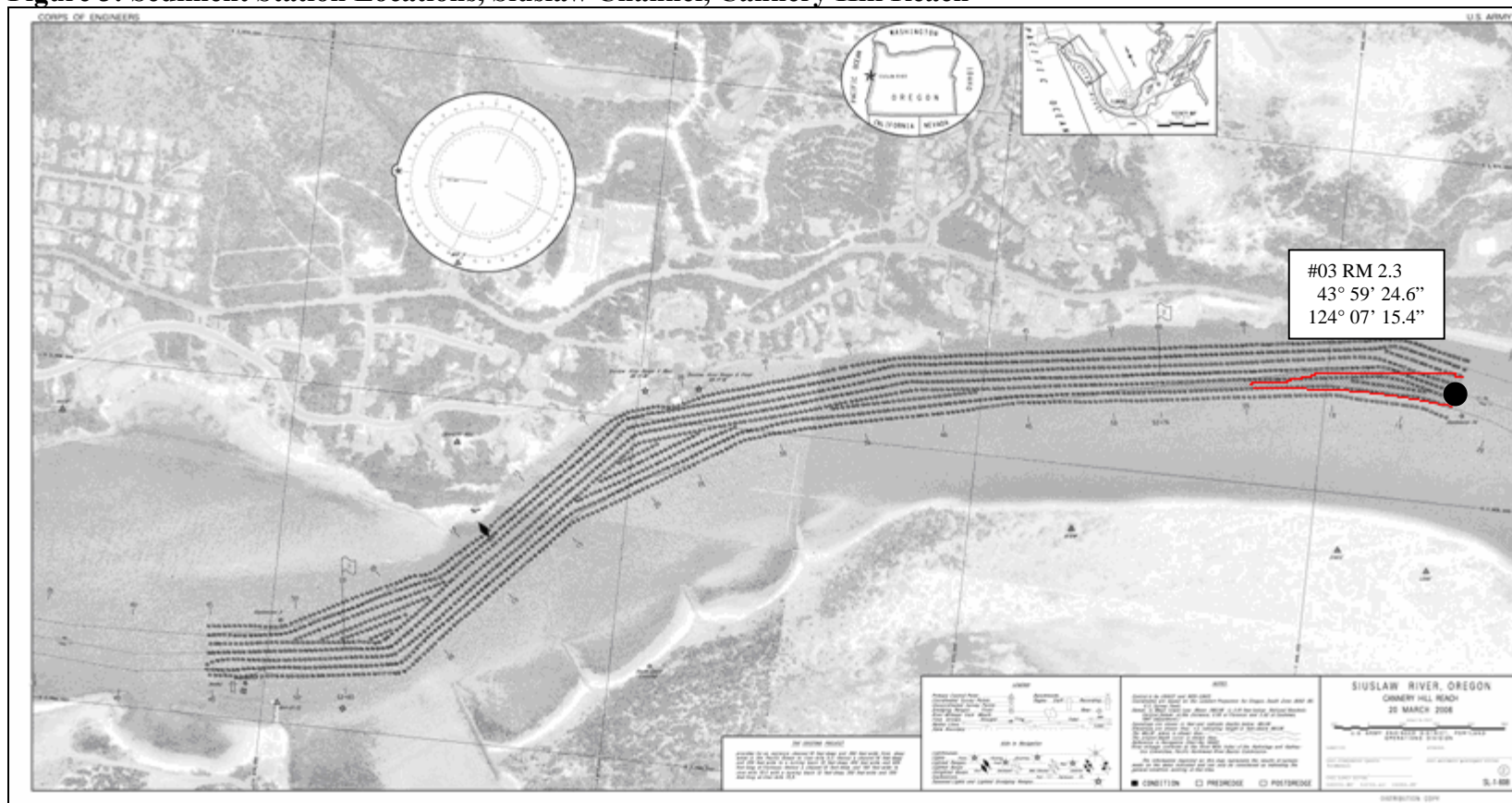
SIUSLAW RIVER SEDIMENT QUALITY EVALUATION Sampled August 29, 2006

Figure 2: Sediment Station Locations, Siuslaw Channel, Entrance



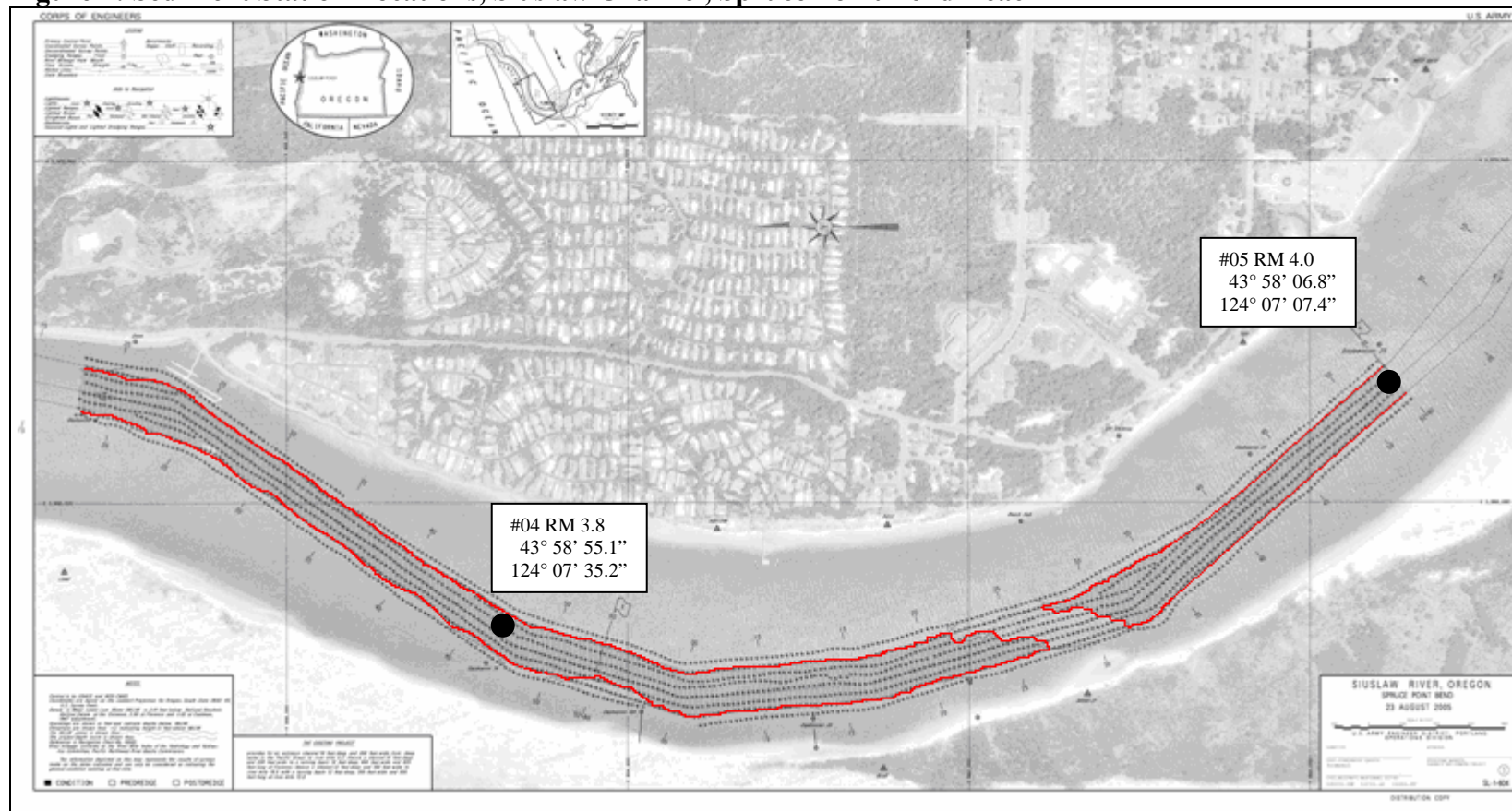
SIUSLAW RIVER SEDIMENT QUALITY EVALUATION Sampled August 29, 2006

Figure 3: Sediment Station Locations, Siuslaw Channel, Cannery Hill Reach



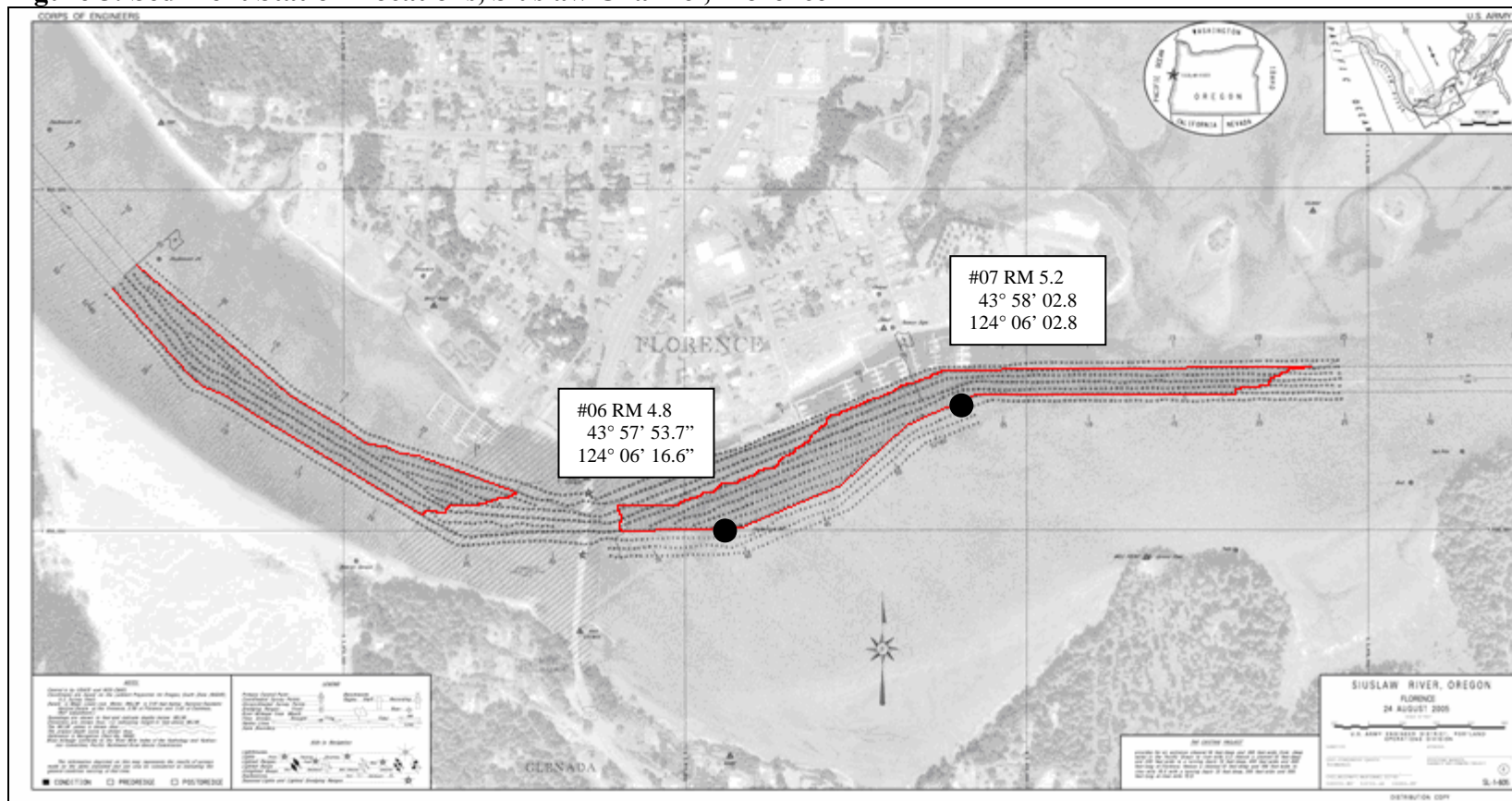
SIUSLAW RIVER SEDIMENT QUALITY EVALUATION Sampled August 29, 2006

Figure 4: Sediment Station Locations, Siuslaw Channel, Spruce Point Bend Reach



SIUSLAW RIVER SEDIMENT QUALITY EVALUATION Sampled August 29, 2006

Figure 5: Sediment Station Locations, Siuslaw Channel, Florence



SIUSLAW RIVER SEDIMENT QUALITY EVALUATION Sampled August 29, 2006

Figure 6: Boat, Sampling Equipment and Representative Sample Material



SIUSLAW RIVER SEDIMENT QUALITY EVALUATION

Sampled August 29, 2006

DMEF REFERENCE TABLE

Testing Parameter, Preparation Method, Analytical Method, Sediment Method Detection Limit (MDL)

PARAMETER	PREP METHOD (recommended)	ANALYSIS METHOD (recommended)	SEDIMENT MDL (1)
CONVENTIONALS:			
Total Solids (%)	---	Pg.17 (2)	0.1
Total Volatile Solids (%)	---	Pg.20 (2)	0.1
Total Organic Carbon (%)	---	Pg.23 (2, 3)	0.1
Total Sulfides (mg/kg)	---	Pg.32 (2)	1
Ammonia (mg/kg)	---	Plumb 1981 (4)	1
Grain Size	---	Modified ASTM with Hydrometer	---
METALS mg/kg (ppm):			
Antimony	APNDX D (5)	GFAA (6)	2.5
Arsenic	APNDX D (5)	GFAA (6)	2.5
Cadmium	APNDX D (5)	GFAA (6)	0.3
Chromium	APNDX D (5)	GFAA (6)	0.3
Copper	APNDX D (5)	ICP (7)	15.0
Lead	APNDX D (5)	ICP (7)	0.5
Mercury	MER (8)	7471 (8)	0.02
Nickel	APNDX D (5)	ICP (7)	2.5
Silver	APNDX D (5)	GFAA (6)	0.2
Zinc	APNDX D (5)	ICP (7)	15.0
ORGANOMETALLIC COMPOUNDS (ug/L):			
Tributyltin (interstitial water)	NMFS	Krone	0.01

SIUSLAW RIVER SEDIMENT QUALITY EVALUATION

Sampled August 29, 2006

DMEF REFERENCE TABLE (CONTINUED)

ORGANICS ug/kg (ppb):			
<u>LPAH</u>			
Naphthalene	3550 (9)	8270 (10)	20
Acenaphthylene	3550 (9)	8270 (10)	20
Acenaphthene	3550 (9)	8270 (10)	20
Fluorene	3550 (9)	8270 (10)	20
Phenanthrene	3550 (9)	8270 (10)	20
Anthracene	3550 (9)	8270 (10)	20
2-Methylnaphthalene	3550 (9)	8270 (10)	20
Total LPAH			
<u>HPAH</u>			
Fluoranthene	3550 (9)	8270 (10)	20
Pyrene	3550 (9)	8270 (10)	20
Benzo(a)anthracene	3550 (9)	8270 (10)	20
Chrysene	3550 (9)	8270 (10)	20
Benzo(a)fluoranthene	3550 (9)	8270 (10)	20
Benzo(a)pyrene	3550 (9)	8270 (10)	20
Indeno(1,2,3-c,d)pyrene	3550 (9)	8270 (10)	20
Dibenzo(a,h)anthracene	3550 (9)	8270 (10)	20
Benzo(g,h,i)perylene	3550 (9)	8270 (10)	20
Total HPAH			
<u>CHLORINATED HYDROCARBONS</u>			
1,3-Dichlorobenzene	P&T (12)	8260 (11)	3.2
1,4-Dichlorobenzene	P&T (12)	8260 (11)	3.2
1,2-Dichlorobenzene	P&T (12)	8260 (11)	3.2
1,2,4-Trichlorobenzene	3550 (9)	8270 (10)	6
Hexachlorobenzene (HCB)	3550 (9)	8270 (10)	12

SIUSLAW RIVER SEDIMENT QUALITY EVALUATION

Sampled August 29, 2006

DMEF REFERENCE TABLE (CONTINUED)

<u>PHTHALATES</u>		ug/kg	
Dimethyl phthalate	3550 (9)	8270 (10)	20
Diethyl phthalate	3550 (9)	8270 (10)	20
Di-n-butyl phthalate	3550 (9)	8270 (10)	20
Butyl benzyl phthalate	3550 (9)	8270 (10)	20
Bis(2-ethylhexyl)phthalate	3550 (9)	8270 (10)	20
Di-n-octyl phthalate	3550 (9)	8270 (10)	20
<u>PHENOLS</u>			
Phenol	3550 (9)	8270 (10)	20
2 Methylphenol	3550 (9)	8270 (10)	6
4 Methylphenol	3550 (9)	8270 (10)	20
2,4-Dimethylphenol	3550 (9)	8270 (10)	6
Pentachlorophenol	3550 (9)	8270 (10)	61
<u>MISCELLANEOUS EXTRACTABLES</u>			
Benzyl alcohol	3550 (9)	8270 (10)	6
Benzoic acid	3550 (9)	8270 (10)	100
Dibenzofuran	3550 (9)	8270 (10)	20
Hexachloroethane	3550 (9)	8270 (10)	20
Hexachlorobutadiene	3550 (9)	8270 (10)	20
N-Nitrosodiphenylamine	3550 (9)	8270 (10)	12
<u>PESTICIDES</u>			
Total DDT	---	---	---
p,p'-DDE	3540 (13)	8081 (13)	2.3
p,p'-DDD	3540 (13)	8081 (13)	3.3
p,p'-DDT	3540 (13)	8081 (13)	6.7
Aldrin	3540 (13)	8081 (13)	1.7
Chlordane	3540 (13)	8081 (13)	1.7
Dieldrin	3540 (13)	8081 (13)	2.3
Heptachlor	3540 (13)	8081 (13)	1.7
Lindane	3540 (13)	8081 (13)	1.7
Total PCBs	3540 (13)	8082 (13)	67

1. Dry Weight Basis.
2. Recommended Protocols for Measuring Conventional Sediment Variables in Puget Sound, Puget Sound Estuary Program, 1997.
3. Recommended Methods for Measuring TOC in Sediments, Kathryn Bragdon-Cook, Clarification Paper, Puget Sound Dredged Disposal Analysis Annual Review, May 1993.

4. Procedures For Handling and Chemical Analysis of Sediment and Water Samples, Russell H. Plumb, Jr., EPA/Corps of Engineers, May 1981.
5. Recommended Protocols for Measuring Metals in Puget Sound Water, Sediment and Tissue Samples, Puget Sound Estuary Program, 1997.
6. Graphite Furnace Atomic Absorption (GFAA) Spectrometry - SW-846, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, EPA 1986.
7. Inductively Coupled Plasma (ICP) Emission Spectrometry - SW-846, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, EPA 1986.
8. Mercury Digestion and Cold Vapor Atomic Absorption (CVAA) Spectrometry - Method 747I, SW-846, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, EPA 1986.
9. Sonication Extraction of Sample Solids - Method 3550 (Modified), SW-846, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, EPA 1986. Method is modified to add matrix spikes before the dehydration step rather than after the dehydration step.
10. GCMS Capillary Column - Method 8270, SW-846, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, EPA 1986.
11. GCMS Analysis - Method 8260, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, EPA 1986.
12. Purge and Trap Extraction and GCMS Analysis - Method 8260, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, EPA 1986.
13. Soxhlet Extraction and Method 8080, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, EPA 1997.

SIUSLAW RIVER SEDIMENT QUALITY EVALUATION

Sampled August 29, 2006

SEF REFERENCE TABLE:

Recommended Analytical Methods and Quantitation Limits for Sediment

Parameter	Prep Method	Analysis Method	Sample Quantitation Limit (SQL) ^{1/}
Conventionals:			
Total Solids (%)		EPA 2450-G	0.1
Total Organic Carbon (%)		EPA 5310B mod	0.1
Total Sulfides (mg/kg)		PSEP 1997	1.0
Ammonia (mg/kg)		Plumb 1981	0.1
Grain Size (%)		ASTM D-422 mod	1.0
Metals (mg/kg):			
Antimony	EPA 6010/6020 ^{2/}	EPA 6010/6020	0.5
Arsenic	EPA 6010/6020	EPA 6010/6020	5
Cadmium	EPA 6010/6020	EPA 6010/6020	0.5
Chromium	EPA 6010/6020	EPA 6010/6020	5
Copper	EPA 6010/6020	EPA 6010/6020	5
Lead	EPA 6010/6020	EPA 6010/6020	5
Mercury	EPA 7471	EPA 7471	0.05
Nickel	EPA 6010/6020	EPA 6010/6020	5
Silver	EPA 6010/6020	EPA 6010/6020	0.5
Zinc	EPA 6010/6020	EPA 6010/6020	5
Polynuclear Aromatic Hydrocarbons (µg/kg):			
LPAH			
Naphthalene	EPA 3550-mod	EPA 8270	20
Acenaphthylene	EPA 3550-mod	EPA 8270	20
Acenaphthene	EPA 3550-mod	EPA 8270	20
Fluorene	EPA 3550-mod	EPA 8270	20
Phenanthrene	EPA 3550-mod	EPA 8270	20
Anthracene	EPA 3550-mod	EPA 8270	20
2-Methylnaphthalene	EPA 3550-mod	EPA 8270	20
HPAH			
Fluoranthene	EPA 3550-mod	EPA 8270	20
Pyrene	EPA 3550-mod	EPA 8270	20
Benzo(a)anthracene	EPA 3550-mod	EPA 8270	20
Chrysene	EPA 3550-mod	EPA 8270	20
Benzofluoranthenes	EPA 3550-mod	EPA 8270	20
Benzo(a)pyrene	EPA 3550-mod	EPA 8270	20
Indeno(1,2,3-c,d)pyrene	EPA 3550-mod	EPA 8270	20
Dibenzo(a,h)anthracene	EPA 3550-mod	EPA 8270	20
Benzo(g,h,i)perylene	EPA 3550-mod	EPA 8270	20

SEF REFERENCE TABLE (CONTINUED)

Chlorinated Hydrocarbons (µg/kg):			
1,4-Dichlorobenzene	EPA 3550-mod	EPA 8270	20
1,2-Dichlorobenzene	EPA 3550-mod	EPA 8270	20
1,2,4-Trichlorobenzene	EPA 3550-mod	EPA 8270	20
Hexachlorobenzene (HCB)	EPA 3550/3540	EPA 8270/8081	10
Phthalates (µg/kg):			
Dimethyl phthalate	EPA 3550-mod	EPA 8270	20
Diethyl phthalate	EPA 3550-mod	EPA 8270	20
Di-n-butyl phthalate	EPA 3550-mod	EPA 8270	20
Butyl benzyl phthalate	EPA 3550-mod	EPA 8270	20
Bis(2-ethylhexyl)phthalate	EPA 3550-mod	EPA 8270	100
Di-n-octyl phthalate	EPA 3550-mod	EPA 8270	20
Phenols (µg/kg):			
Phenol	EPA 3550-mod	EPA 8270	20
2 Methylphenol	EPA 3550-mod	EPA 8270	20
4 Methylphenol	EPA 3550-mod	EPA 8270	20
2,4-Dimethylphenol	EPA 3550-mod	EPA 8270	20
Pentachlorophenol	EPA 3550-mod	EPA 8270	100
Miscellaneous Extractables (µg/kg):			
Benzyl alcohol	EPA 3550-mod	EPA 8270	50
Benzoic acid	EPA 3550-mod	EPA 8270	100
Dibenzofuran	EPA 3550-mod	EPA 8270	20
Hexachloroethane	EPA 3550-mod	EPA 8270	20
Hexachlorobutadiene	EPA 3550/3540	EPA 8270/8081	10
N-Nitrosodiphenylamine	EPA 3550-mod	EPA 8270	20
Pesticides/PCBs (µg/kg):			
DDE (p,p', o,p'-)	EPA 3540	EPA 8081	2
DDD (p,p', o,p'-)	EPA 3540	EPA 8081	2
DDT (p,p', o,p'-)	EPA 3540	EPA 8081	2
Aldrin	EPA 3540	EPA 8081	2
Chlordane	EPA 3540	EPA 8081	2
Dieldrin	EPA 3540	EPA 8081	2
Heptachlor	EPA 3540	EPA 8081	2
Lindane	EPA 3540	EPA 8081	2
Total PCBs	EPA 3540	EPA 8082	10

SIUSLAW RIVER SEDIMENT QUALITY EVALUATION
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SEF REFERENCE TABLE (CONTINUED)

Tributyltin (µg/L) ^{3/}:			
TBT in pore water (µg/L Ion)	NMFS/Hoffman	Krone 1989	0.03
TBT in sediment (µg/kg)	NMFS	Krone 1989	5
Notes:			
1/ SQLs are based on dry sample weight assuming no interferences; site-specific method modifications may be required to achieve these SQLs in some cases.			
2/ Includes hydrochloric acid digestion per EPA 3050-B.			
3/ Tributyltin is a chemical of special concern; analysis of this constituent in pore-water or bulk sediment will be determined on a project-specific basis. EPA Method 3550 is modified to add matrix spikes before the dehydration step, not after. mg/kg = milligrams per kilogram; µg/kg = micrograms per kilogram; µg/L = micrograms per liter; % = percent; ASTM = American Society for Testing and Materials			